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An Analysis of Sustainable Rural Livelihoods in Sand and Silt Deposited Areas of Dhemaji District of Assam

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Authors' contributions

This work was carried out in collaboration among all authors. Author DS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors JKS and PKD managed the analyses of the study. Authors IB and SDD managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The study was undertaken in sand and silt deposited areas of Dhemaji district in Assam, primarily to measure physical and social capitals as livelihood assets, compute Sustainable Rural Livelihood index, study selected personal, socio-economic and psychological attributes of farmer respondents as well as to find out the relationship, if any, between Sustainable Rural Livelihoods and the selected personal, socio-economic and psychological attributes of the respondents. A descriptive research design, following an *ex post facto* approach was utilized for the study. A multi-stage, purposive cum proportionate random sampling design was adopted for the study in order to select 100 respondents.

With respect to the selected personal, socio-economic and psychological attributes of the respondents, the study revealed that most of the respondents (88%) were young to middle aged and had medium level of formal education (57%). The study revealed that the proportion of farm families belonging to small and medium sized families were almost equal (46% and 43% respectively).

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Majority (61%) of the respondents was marginal farmers and belonged to the low and medium level of annual income categories (respectively 41% and 46%). On the other hand, a large majority (70%) had low level of annual expenditure pattern, medium level of economic motivation (68%) and risk bearing ability (70%).

The computed Sustainable Rural Livelihood Index score (49.89%) was found to be on the lower side, indicating its relatively low strength based on physical and social capital indices. Correlation analysis of the independent variables of the study with Sustainable Rural Livelihoods revealed that five independent variables, viz., age, education, size of land holding, expenditure pattern and risk bearing ability were positively and significantly correlated with Sustainable Rural Livelihoods.

The study reveals that a productive human capital falling largely in the young to middle age category holds promise for socio-economic development in similar situations. However, illiteracy, coupled with lower formal education would mean that skill development ought to be the focal area for capacity building in the agricultural sector. . Strategic agricultural technology interventions suited for sand and silt affected areas have to planned keeping in mind seasonal uncertainties and low cost technologies.

Keywords: Sustainable; livelihood; PCI; SCI; index; Assam.

1. INTRODUCTION

Assam represents one of the most acutely hazard prone regions in the country. Floods, flash floods, river-bank erosion, and sand casting are the most frequent water- induced hazards in the state. In floodplain areas around the world, farmers use the silt deposits that floods bring as a traditional way to upgrade soil quality. However, floods can also cause a sandy layer to be deposited, which can have long-term impacts on soil fertility. This problem is particularly significant in Dhemaji district in north-eastern Assam where sand deposition is making it difficult for many farmers to make a living, thereby adversely affecting livelihoods [1]. Small per capita land holding coupled with low productivity pose a big challenge to crop production, which constitutes a substantial share to the livelihood of the agrarian society in such areas. Farmers in large tracts of the district have been left with little means to cope with the adverse effects of sand and silt deposition.

Improving the livelihoods of small and marginal farmers can be achieved only when proper assessment is made with respect to the livelihood options these farmers are having. In this backdrop, it becomes important to critically analyze the rural poverty and sustainable livelihoods of the farmers to get insight into the strengths and weaknesses of these households in their endeavours and commitment for enhancing livelihood options and combat poverty through proper technology adoption [2]

The concept of Sustainable Rural Livelihood (SRL) is an attempt to go beyond the conventional definitions and approaches to poverty eradication [3]. It is now recognized that more attention must be paid to the various factors and processes which either constrain or enhance poor people's ability to make a living in an economically, ecologically, and socially sustainable manner. The SRL concept offers a more coherent and integrated approach to poverty. It is concerned first and foremost with people. It seeks to gain an accurate and realistic understanding of people's strengths (assets or capital endowments) and how they endeavour to convert these into positive livelihood outcomes. The approach is founded on a belief that people require a range of assets to achieve positive livelihood outcomes; no single category of assets on its own is sufficient to yield all the many and varied livelihood outcomes that people seek. This is particularly true for poor people whose access to any given category of assets tends to be very limited. As a result they have to seek ways of nurturing and combining what assets they do have in innovative ways to ensure survival. To achieve sustainable rural livelihoods, different livelihood capitals such as Human capital, Physical capital, Natural capital, Social capital and Financial capital would play a greater role to cope with or recover from shocks /stresses and maintain or enhance the individuals capabilities and assets both in present and in the future without degrading the natural resource base [4,5]. Against this backdrop, the present study was conducted to understand the livelihood of farmers facing problems of sand and silt deposition with the following objectives:

1. To study the selected personal, socio-economic and psychological attributes of

the respondents in sand and silt deposited areas
2. To measure the physical capital as a livelihood asset in sand and silt deposited areas
3. To measure the social capital as a livelihood asset in sand and silt deposited areas
4. To compute the Sustainable Rural Livelihoods in sand and silt deposited areas and to find out the relationship, if any, between Sustainable Rural Livelihoods and the selected personal, socio-economic and psychological attributes of the respondents

2. METHODOLOGY

The present study was carried out in Dhemaji district of Assam to analyse the Sustainable Rural Livelihoods of people in sand and silt deposited areas. A descriptive research design, following an *ex post facto* approach was utilised for the study. A multi-stage, purposive cum proportionate random sampling design was adopted for the study in order to select 100 respondents. Data was collected with the help of a pretested, structured research schedule, using the personal interview method.

The dependent variable for the present study was Sustainable Rural Livelihoods. The dependent variable was measured by using the scale developed by Sustainable Rural Livelihoods index developed by Directorate of Rice Research, Govt. of India (2012) [6]. Keeping in view the constraints of time and resources, two capital assets, viz., Physical capital and Social capital were selected to study Sustainable Rural Livelihoods. Accordingly, eight independent variables were selected for the present study, viz., Age, Education, Family Size, Size of Land Holding, Annual Income, Expenditure Pattern, Economic Motivation and Risk bearing Ability.

Appropriate statistical tools including measures of central tendency, measures of dispersion and measures of relationship were utilized to analyze the raw data in order to arrive at valid conclusions. The statistical techniques and tests used in the study for analysis and interpretation of data were frequency, percentage, mean, standard deviation, co-efficient of variation, Pearson's product moment correlation coefficient, t-test and Z-value.

3. FINDINGS AND DISCUSSIONS

3.1 Personal, Socio-economic and Psychological Attributes of the Respondents

A total of eight independent variables *viz*., Age, Education, Family Size, Size of Land Holding, Annual Income, Expenditure Pattern, Economic Motivation and Risk bearing ability were included under the purview of the study. The respondents were categorized on the basis of descriptive statistics in relation to each characteristic.

3.2 Age, Education and Family Size

Data presented in Table 1 reveals that majority of the respondents (36.00%) belonged to the young age category followed by middle aged category (52.00%). Only 12.00 % of the respondents belonged to the old age category. The mean value (42.33) indicates that on an average the respondents belonged to middle aged category. The coefficient of variation (31.46%) indicates that the respondents were moderately heterogeneous with respect to their age.

Data presented in table also reveals that majority of the respondents (32.00%) had formal education upto high school level, followed by those having education upto middle school level (25.00%). Significantly, 21.00% of the respondents were illiterate. A few respondents (9.00%) were primary school passed and an equal proportion of them had higher secondary level of education. Only 2.00% of the respondents were found to be graduates or above. The coefficient of variation (60.71%) indicates that the respondents were highly heterogeneous with respect to their education. The finding shows that the majority of the respondents had relatively low level of formal education, as indicated by the mean value (2.8). A high incidence of illiteracy may be attributed to the poor economic status of households, for whom securing livelihoods was of greater priority than formal education. The livelihood vulnerability in turn might be due to floods causing sand and silt deposition, rendering farming a challenging affair.

Table 1. Distribution of respondents according to their age and education and family size

Age						
Category	**Score range**	**Frequency**	**Percentage**	**Mean**	**S.D.**	**C.V.**
Young	18 to 35 years	36	36.00			
Middle aged	36 to 59 years	52	52.00			
Old	60 years and above	12	12.00	42.33	13.32	31.46
	Total	100	100.00			
Education						
Category	**Score**	**Frequency**	**Percentage**	**Mean**	**S.D.**	**C.V.**
Illiterate	0	21	21.00			
Can read only	1	2	2.00			
Can read and write/primary level	2	9	9.00			
Middle school level	3	25	25.00	2.8		60.71
High school level	4	32	32.00		1.70	
H .S. /P .U. level	5	9	9.00			
Graduate /diploma or above	6	2	2.00			
	Total	100	100.00			
Family Size						
Category	**Score range**	**Frequency**	**Percentage**	**Mean**	**S.D.**	**C.V.**
Small family	size Up to 4	46	46.00			
Medium family	size 5-7	43	43.00			
Large family	size 8 and above	11	11.00	5.17	1.92	37.29
	Total	100	100.00			

As revealed by table, majority of the respondents (46.00%) in the study area had small size of family followed by respondents having medium family size (43.00%). Only 11.00% of the respondents had large size of family. The coefficient of variation (37.29%) indicated that the respondents were moderately heterogeneous with respect to their family size.

3.3 Size of Land Holding, Annual Income and Expenditure Pattern

A perusal of Table 2 reveals that majority of the respondents (61.00%) were marginal farmers followed by small farmers (31.00%). Small proportions were semi-medium (5%) and medium farmers (3%). There were no large farmers among the respondents. The value of coefficient of variation (75.54%) indicated that the respondents were highly heterogeneous with respect to their operational land holding size.

Te Table also highlights that 38.00% of the respondents had annual income in the range of Rs. 22000 – 50000/- per year, with an equal proportion falling in the range of Rs. 50001-75000/-. While 7% of the respondents had annual income in the range of Rs. 75001 – 1,00,000/-, 13% of the respondents had annual income above Rs. 1,00,000/-. The Below Poverty Line (BPL) category accounted for 4% of the respondents. The mean value (2.87) indicates the low annual income level of the respondents, while the coefficient of variation (36.93%) indicated that the respondents were moderately heterogeneous with respect to their annual income.

The findings related to the annual expenditure pattern of the respondents are presented in Table 2. The data highlights that 64.00% of the respondents had an annual expenditure pattern between Rs. 22000 – 50000/- per year. On the other hand, 21.00% of the respondents had an expenditure pattern between Rs. 50001-75000/- per year. Equal proportions (6%) of the respondents had expenditure pattern in the ranges of less than Rs. 22,000/- and between Rs. 75001-1,00,000/- per year. Only 3% of the respondents had expenditure pattern above Rs. 1, 00,000/- per year.

The mean value (2.36) indicates that by and large the respondents fell in the low annual expenditure category. The value of coefficient of variation (34.32%) indicated that the respondents were moderately heterogeneous with respect to their expenditure pattern. There exist similarities

between the income and expenditure patterns of the people, as is depicted by Table. It is logical to say that lower incomes would invite lower expenditure levels.

3.4 Economic Motivation and Risk Bearing Ability

Table 3 presents the findings related to economic motivation and risk bearing ability of the respondents. It is evident from the Table that majority of the respondents (68.00%) had medium level of economic motivation, followed by 20.00% with high level of economic motivation. Only 12.00% of the respondents were found to have low level of economic motivation. The coefficient of variation (18.78%) indicated that the respondents were relatively homogenous with respect to their economic motivation. The standard deviation figure (5.77) also shows that respondents by and large clustered around the mean value (30.72), which depicted medium strength of economic motivation. Lower levels of formal education and low income levels might have indirectly influenced economic motivation as those who are educated and better informed and are better positioned economically, are more likely to have greater aspirations towards profit maximization.

The Table highlights that majority of the respondents (70.00%) had medium level of risk bearing ability, followed by 19.00% with high level of risk bearing ability. Only 11.00% of the respondents were found with low level of risk bearing ability.The standard deviation value (5.44) and the coefficient of variation (17.60%) indicated that the respondents were homogenous with respect to their risk bearing ability. Risk bearing ability logically increases when farmers have good income levels and have more land resources. On both these aspects the respondents were weak and hence they did not have high risk bearing ability.

Table 2. Distribution of respondents according to their size of land holding, annual income and expenditure pattern

Size of land holding						
Category	**Score range**	**Frequency**	**Percentage**	**Mean**	**S.D.**	**C.V.**
Marginal	Below 1.0 ha	61	61.00			
Small	1.0-2.0 ha	31	31.00			75.54
Semi-Medium	2.0-4.0 ha	5	5.00	0.969	0.732	
Medium	4.0-10.0 ha	3	3.00			
Large	10.0 ha and above	0	0.00			
	Total	100	100.00			
Annual income						
Income range	**Score**	**Frequency**	**Percentage**	**Mean**	**S.D.**	**C.V.**
Below Rs.22000/- per year (Poverty line)	1	4	4.00			
22000 – 50000/- per year	2	38	38.00			
50001 – 75000/- per year	3	38	38.00			
75001 - 1,00,000/- per year	4	7	7.00	2.87	1.06	36.93
>1,00,000/- per year	5	13	13.00			
	Total	100	100.00			
Expenditure pattern						
Expenditure range (Rs.)	**Score**	**Frequency**	**Percentage**	**Mean**	**S.D.**	**C.V.**
Below Rs.22000/- per year (Poverty line)	1	6	6.00			
22000 – 50000/- per year	2	64	64.00			
50001 – 75000/- per year	3	21	21.00			
75001 - 1,00,000/- per year	4	6	6.00	2.36	0.81	34.32
>1,00,000/- per year	5	3	3.00			
	Total	100	100.00			

3.5 Measurement of Physical Capital as a Livelihood Asset

Physical capital of the respondents was measured based on the pooled strengths of six indicator variables, viz., affordable transport, secure shelter, source of drinking water, source of domestic fuel, information source accessibility and material possession.

3.6 Affordable Transport and Secure Shelter

Table 4 projects the data realating to the affordable transport and secure shelter of the respondents. The Table reveals that 75.00% of the respondents had bicycle as means of transport, 15.00% used public transport and 2.00% of the respondants availed shared taxi/auto. About 8.00% of the respondants had their own vehicle. About 91% of the respondents were in the medium category of affordable transport. The coefficient of variation (61.34%) indicated that the respondents were relatively heterogeneous with respect to their affordable transport. The affordable transport data reflects the poor economic status of the respondents who are unable to afford better means of transport.

The Table reveals that 53.00% of the respondents lived in Kutcha/temporary house followed by 27.00% in pucca/permanent house. While 12.00% of the respondents lived in temporary shelters, the remaining 8.00% had semi permanent house. The coefficient of variation (41.12%) indicated that the respondents were heterogeneous with respect to their type of house. The data also highlights the vulnerability of people in sand and silt deposited areas whose poor economic status and damage to property by recurring floods have forced them to take shelter in makeshift/temporary accommodations.

3.7 Source of Drinking Water and Source of Domestic Fuel

Data pertaining to the source of drinking water and source of domestic fuel of the respondents is presented in Table 5. The Table reflects that 98.00% of the respondents used water from wells/tube wells as their source of drinking water, with 2.00% depending on pond/river water to meet their drinking water requirements. It is worth mentioning that there was no water supply in the areas of investigation. The coefficient of variation (7.10%) indicated that the respondents were highly homogeneous with respect to their source of drinking water.

It is evident from the Table that 60.00% of the respondents used firewood as their source of domestic fuel followed by 28.00% using LPG and remaining 12.00% using kerosene as a source of domestic fuel. The coefficient of variation (52.12%) indicated that the respondents were relatively heterogeneous with respect to their source of domestic fuel. It is noteworthy that majority of the respondents were using firewood as the source of domestic fuel, which is considered to be a poor source and not environment friendly. This may be on account of the poor socio-economic status of the respondents because of livelihood disruption on account of floods and/or sand & silt deposition in cultivable areas.

Table 3. Distribution of respondents according to their economic motivation and risk bearing ability

Economic motivation						
Category	**Score range**	**Frequency**	**Percentage**	**Mean**	**S.D.**	**C.V.**
Low	Up to 24.95	12	12.00			
Medium	Between 24.95 to 36.49	68	68.00			
High	Above 36.49	20	20.00	30.72	5.77	18.78
	Total	100	100.00			
Risk bearing ability						
Category	**Score range**	**Frequency**	**Percentage**	**Mean**	**S.D.**	**C.V.**
Low	Up to 25.46	11	11.00			
Medium	Between 25.46 to 36.34	70	70.00			
High	Above 36.34	19	19.00	30.90	5.44	17.60
	Total	100	100.00			

Table 4. Distribution of respondents according to their affordable transport and secure shelter
n=100

Affordable transport				
Category	**f (%)**	**f (%)**		
		Low affordable transport	**Medium affordable transport**	**High affordable transport**
1. Bicycle	75(75.00)			
2. Public transport	15(15.00)			
3. Shared taxi/auto	2(2.00)			
4. Own Vehicle	8(8.00)			
Mean: 1.41		0.00	91	09
SD: 0.86		(0.00)	(91.00)	(9.00)
CV: 61.34				
Secure shelter				
Category	**f (%)**	**f (%)**		
		Low affordable transport	**Medium affordable transport**	**High affordable transport**
1. Temporary shelter	12(12.00)	13	60	27
2. Kutcha/temporary house	53(53.00)	(13.00)	(60.00)	(27.00)
3. Semi permanent house	8(8.00)			
4. Pucca/permanent house	27(27.00)			
Mean: 2.48				
SD: 1.02				
CV: 41.12				

3.8 Information Source Accessibility and Material Possession

Table 6 presents data relating to the information source accessibility and material possession of the respondents regarding on-farm and off-farm activities. The data shows that 44.00% of the respondents depended on neighbors for accessing required information, followed by 40.00% accessing information from the mass media and 10.00% from progressive farmers. Only 6.00% of the respondents had access to extension functionaries for getting required information. The coefficient of variation (54.77%) indicated that the respondents were relatively heterogeneous with respect to their information source accessibility. By and large, the data set reflects relatively weak accessibility to information of the respondents and the absence of a strong agricultural extension support mechanism.

The Table shows that 31% of the respondents had no material possession at all followed by 25.00% of the respondents having two farm animals or materials (bullock cart /radio). Similarly, 18.00% of the respondents had five to ten farm animals or materials (Gobar gas /spraying equipment / motor cycle), 15.00% had one animal or material (bullock / buffalo/cow/ bicycle / furniture) and 9.00% had three farm animals or material (improved implements / plant protection equipment / electricity). Only 2.00% of the respondents had more than ten farm animals or materials (Tractor /Automobiles / TV). The coefficient of variation (54.77%) indicated that the respondents were relatively heterogeneous with respect to their material possession and overall majority of the respondents (51%) were medium with respect to their material possession, followed by 31% falling in the low level of material possession. The by and large low levels of material possession may be on account of the low income levels of the people and damage by floods.

The Physical Capital Index (PCI) score for the respondents was calculated by utilizing the following formula:

$$\text{PCI} = \frac{\text{Actual score of the Physical capital obtained by the respondent}}{\text{Maximum possible score}} \times 100$$

The average Physical Capital Index (PCI) was estimated at 49.12%, which was by and large on the lower side.

3.9 Measurement of Social Capital as a Livelihood Asset

Social capital of the respondents was measured based on the pooled strengths of two indicator variables, *viz.,* socio-political participation and extent of trust.

3.10 Socio-Political Participation and Extent of Trust

Findings related to the socio-political participation and extent of trust of the respondents are presented in Table 7. The Table reveals that majority of the respondents (54.00%) had membership in one organization followed by 42.00% having no membership in any organization. Only 4.00% of the respondents had active involvement in community work. It is worth mentioning that there were no respondents involved as an office bearer in socio political organizations. The mean (1.66) and standard deviation (0.68) values indicate low socio-political participation while the CV (40.96%) suggests that respondents were relatively heterogeneous with respect to socio-political participation. Majority of the respondents belonged to the low to medium categories with respect to their socio-political participation.

As is evident from the Table, 27% of the respondents had small extent of trust on other members of the village while 26.00% expressed trust to a great extent. About 24% of the respondents had neither small nor great extent of trust and 13% expressed no trust at all. Only 10% of the respondents expressed complete trust on other members of the village society. Overall half (50%) of the respondents had medium level of trust, with 41% having low trust on members of the village society. Only 9% expressed high trust. It is evident from the findings that there exists 'trust deficit' among the people which is a matter of concern in such areas as they are expected to work together with mutual belief to confront the vagaries of nature as well as their economic disadvantage. The CV value of 41% depicts that the respondents were somewhat heterogeneous in their responses on the extent of trust.

The Social Capital Index (SCI) score for the respondents was calculated by utilizing the following formula:

$$SCI = \frac{\text{Actual score of the Social capital obtained by the respondent}}{\text{Maximum possible score}} \times 100$$

The average Social Capital Index (SCI) was estimated at 50.66%, which was by and large of moderate strength.

3.11 Computation of Sustainable Rural Livelihoods

The Sustainable Rural Livelihoods Index for the sample was estimated by taking the mean of the Physical and Social Capital indices. This was worked out as under:

Average Physical Capital Index(PCI)	Average Social Capital Index(SCI)	Sustainable Rural Livelihood (SRL) Index SRL Index = $\frac{\sum PCI+SCI}{2}$
49.12	50.66	49.89%

As is evident from the above, the computed Sustainable Rural Livelihood Index (SRL Index) of 49.89% is by and large on the lower side and indicates relatively lower strengths of Physical capital and Social capital in determining the SRL index. There hardly exists any difference between the index strengths of Physical capital and Social capital. The computed value indicates that the respondents in the sand and silt deposited areas have relatively low Physical and Social capital strengths which accounted for their overall low Sustainable Rural Livelihood index strength. The inference is that Physical and Social capitals of the people in similar situations have to be strengthened if Sustainable Rural Livelihood strengths are to be increased.

3.12 Relationship between Sustainable Rural Livelihoods and the Selected Personal, Socio-economic and Psychological Attributes of the Respondents

For the purpose of studying the strength of relationship between Sustainable Rural Livelihoods and the selected independent variables, correlation analysis was utilized for the present study. The Pearson's product moment correlation coefficients between Sustainable Rural Livelihoods and the selected independent variables of the study are presented in Table 8. A perusal of data presented in Table shows that five variables, *viz,* age, education, size of land holding, expenditure pattern and risk bearing ability were positively and significantly correlated with Sustainable Rural Livelihoods. This meant that an increase in strength of these variables resulted in a corresponding increase in the strength of Sustainable Rural Livelihoods and vice versa.

Table 5. Distribution of respondents according to their source of drinking water and source of domestic fuel

n=100

Source of drinking water					
Category		**f (%)**	**Mean**	**S.D.**	**C.V.**
1.	Pond/river	2(2.00)	2		
2.	Well/tube well	98(98.00)		0.142	
3.	Supply water	0(0.00)			7.1
Source of domestic fuel					
Category		**f (%)**	**Mean**	**S.D.**	**C.V.**
1.	Firewood		1.65		
2.	Kerosene			0.86	
3.	LPG				52.12

Table 6. Distribution of respondents according to their information source accessibility and material possession

n=100

Information source accessibility				
Category	**f (%)**	**f (%)**		
		Poor information source accessibility	**Satisfactory information source accessibility**	**Good information source accessibility**
1.Neighbors	44(44.00)			
2.Progressive farmers	10(10.00)			
3.Mass media	40(40.00)	44	50	06
4.Extension functionaries	6(6.00)	(44.00)	(50.00)	(6.00)
Mean: 2.72				
SD: 1.49				
CV: 54.77				
Material possession				
Category	**f (%)**	**f (%)**		
		Low material possession	**Medium material possession**	**High material possession**
1. None	31 (31.00)			
2. One animal or material (bullock / buffalo/cow/ bicycle / furniture)	15 (15.00)			
3. Two farm animals or materials (bullock cart /radio)	25 (25.00)	31		

4. Three farm animals or material (improved implements / pp equipment / electricity)	9 (9.00)	(31.00)		
5. Five to ten farm animals or materials (Gobar gas /spraying equipment / motor cycle)	18 (18.00)		51 (51.00)	08 (8.00)
6. More than ten farm animals or materials (Tractor /Automobiles / TV)	2 (2.00)			
Mean: 2.72				
SD: 1.49				
CV: 54.77				

Table 7. Distribution of respondents according to their socio-political participation and extent of trust

n=100

Socio-political participation				
Category	**f (%)**	**f (%)**		
		Low participation	**Medium participation**	**High participation**
1. Without any membership in socio political organization	42(42.00)			
2. Membership in one or more socio political organizations	54(54.00)			
3. Office bearer in one or more socio political organizations	0(0.00)			
4. Active involvement in community work	4(4.00)	42 (42.00)	54 (54.00)	04 (4.00)
Mean: 1.66				
SD: 0.68				
CV: 40.96				
Extent of trust				
category	**f (%)**	**f (%)**		
		Low extent of trust	**Medium extent of trust**	**High extent of trust**
1. No trust	13(13.00)	41 (41.00)	50 (50.00)	09 (9.00)
2. To a small extent	27(27.00)			
3. Neither small nor great extent	24(24.00)			
4. To a great extent	26(26.00)			
5. Complete trust	10(10.00)			
Mean: 2.90				
SD: 1.19				
CV: 41.0				

Table 8. Correlation coefficients between Sustainable Rural Livelihoods and the selected independent variables of the study

Sl No.	Independent variable	Correlation coefficient (r)	't' value
1	Age	0.200*	2.020*
2	Education	0.263**	2.698**
3	Family size	(-)0.025 (NS)	(-)0.247
4	Size of land holding	0.436**	4.796**
5	Annual income	0.058 (NS)	0.575
6	Expenditure pattern	0.256*	2.621*
7	Economic motivation	(-) 0.115 (NS)	(-) 1.146
8	Risk bearing ability	0.225*	2.286*

***Significant at the 0.01 level of probability*
**Significant at the 0.05 level of probability*
Degrees of freedom (df) = 98

Barring the variables of education and size of land holding, which were significantly correlated at the 0.01 level, the other variables, i.e., age, expenditure pattern and risk bearing ability were correlated at the 0.05 level with Sustainable Rural Livelihoods. The magnitude or strength of the relationship, as indicated by the 'r' values, suggest that the relationship was fairly strong with size of land holding while it was of moderate strength for the remaining four correlated variables. The relationship was found to be non-significant for the remaining three independent variables, *i.e.,* family size, annual income and economic motivation.

4. IMPLICATIONS AND CONCLUSIONS

Te study reveals that a productive human capital falling largely in the young to middle age category holds promise for socio-economic development in similar situations. However, illiteracy, coupled with lower formal education would mean that skill development ought to be the focal area for capacity building in the agricultural sector. Low annual incomes and preponderance of marginal farmers is a challenge in the development perspective [7]. Strategic agricultural technology interventions suited for sand and silt affected areas have to planned keeping in mind seasonal uncertainties and low cost technologies. Indicators of social well being presents a sorry picture as the people lacked proper housing, assured source of drinking water, affordable and easy transport and environment friendly domestic fuel. The government should ensure that the benefits of flagship social welfare programmes such as Pradhan Mantri Awas Yojana, Pradhan Mantri Gram Sadak Yojana, Pradhan Mantri Ujjwala Yojana, National Rural Drinking Water Programme etc. reach the most vulnerable sections of the society. It would be foolhardy to expect the penetration of climate resilient, adaptive and mitigating agricultural technologies in such situations when the reach of the formal extension machinery is limited to only six per cent of the population. It is therefore the call of the hour to put in place innovative, responsive and dedicated extension machinery in sand and silt deposited areas in order to ensure that such technologies are popularised and are adopted by the farmers for their own benefit. . It is a matter of concern that 31% of the farm families had no material possession such as farm animals or equipments. The animal sector complements the cropping sector and vice versa. As such it would be difficult to achieve the desired levels of crop productivity without the availability of farmyard manure and draught power. The findings also reveal that 60% of farm families depended on firewood as their source of domestic fuel and hence promoting the animal sector can also facilitate the use of bio-gas by the people. To take care of the need for farm equipments and machineries of the poor farmers, subsidised custom hiring facilities can be promoted by the government in similar situations. Socio-political participation of the people is required to increase their negotiation and bargaining powers and ensure that their rights and interests are not denied. This can only happen when there is an environment of trust and hence both are interrelated. To achieve this, small farmer groups in the form of SHGs/FIGs/CIGs/FPOs etc. can be formed with capacity building and handholding support [8-12].

Skill development, promoting low cost, adaptive and mitigating agricultural technologies, Common Property Resource Management, implementing flagship social welfare programmes, strengthening agricultural

extension, promoting animal sector, organizing farmers, diversification, short term income generation, increasing risk bearing ability, capacity building and financial inclusion for the people in sand and silt deposited areas are the general recommendations of the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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